Market Deregulation and Optimal Monetary Policy in a Currency Union

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ESSIM, Izmir, 2013

Motivation

- Wave of crises that began in 2008 reheated the debate on market deregulation as a tool to improve economic performance.
- Policies promoting competition and labor market flexibility at the heart of the debate.
  - Deregulation of product markets should facilitate producer entry, boosting business creation and enhancing competition.
  - Deregulation of labor markets should enhance reallocation of resources and speed up the adjustment to shocks.
- Academic literature supports this view:
  - Blanchard and Giavazzi (2003), Cacciatore and Fiori (2011), Ebell and Haefke (2009), Felbermayr and Prat (2011);
  - Fiori et al. (2011), Griffith, Harrison, and Maccartney.

This Paper

- Little work on the consequences of deregulation for macroeconomic policy.
  - Market reforms in Europe should be accompanied by active policies supporting aggregate demand (Barkbu et al., 2012).
- We focus on monetary policy in a monetary union:
  - What is the optimal policy response to goods and labor market reform?
  - How does optimal policy change as these reforms affect the characteristics of the business cycle?
  - What is the international dimension of market deregulation?

Setup

- DSGE model of a monetary union:
  - endogenous product creation subject to sunk costs as in Bilbiie, Ghironi, and Melitz (2012),
  - search-and-matching frictions in labor markets as in Diamond (1982) and Mortensen and Pissarides (1994),
  - sticky prices and wages.
- Market Deregulation reduces:
  - sunk producer entry costs related to product market regulation ("red tape");
  - unemployment benefits and workers' bargaining power.
- Parsimonious set of ingredients to capture key empirical features of product and labor market regulation and reform.

Exercises

- We choose Europe's Economic and Monetary Union (EMU) for our calibration and show that the model successfully reproduces several features of the data.

- We obtain the Ramsey-optimal allocation subject to policy tradeoffs with high regulation.

- And we study how deregulation affects policy tradeoffs and characterize its implications for optimal monetary policy.

- The debate on rigidity of European markets and its implications for policy actually pre-dates the crisis.

  $\Rightarrow$ We do not cast our analysis as an evaluation of ongoing responses to the crisis (most specifically, by the ECB).

Results

- High regulation: optimal policy requires significant departures from price stability both in the long run and over the business cycle.
  - Historical ECB policy rule (which approximates price stability) is costly (0.5% of steady-state consumption).
- Adjustment to market reforms requires expansionary policy to reduce transition costs.
  - The optimal response is more expansionary than dictated by historical behavior.
- Market deregulation reduces static and dynamic distortions, making price stability more desirable.
- International coordination of reforms is beneficial as it eliminates policy tradeoffs generated by asymmetric deregulation.

Intuition

Optimal Policy under High Regulation

- High regulation in goods and labor markets implies:
  - too high steady-state markups and too low job creation;
  - too volatile cyclical unemployment fluctuations.
- The Ramsey policymaker:
  - uses positive long-run inflation to mitigate long-run inefficiencies;
  - departures from price stability over the cycle to reduce the procyclicality of job creation (at the cost of more volatile product creation).

Intuition, Continued

Deregulation and Optimal Policy

- Deregulation reduces distortions in goods and labor markets.
- Since benefits take time to materialize, the Ramsey central bank expands monetary policy more aggressively than historical ECB.
  - It generates lower markups and boost job creation along the transition.
- Once the beneficial effects of reforms are fully materialized, there is less need of positive long-run inflation to close inefficiency gaps.
  - Price stability over the cycle is less costly.

Intuition, Continued

Synchronization of Reforms and Optimal Policy

- Welfare benefits of optimal policy depend on the union-wide pattern of deregulation.
- Asymmetric deregulation alters the policy tradeoffs facing the Ramsey central bank.
  - Optimal policy must strike a balance between countries that differ in the desirability of price stability (both in the long run and over the cycle).
- Internationally synchronized reforms remove this tradeoff, resulting in larger welfare gains from optimal policy.

Related Literature

- Macroeconomic effects of market deregulation.
  - Blanchard and Giavazzi (2003), Cacciatore and Fiori (2011), Dawson and Seater (2011), Eggertsson, Ferrero, and Raffo (2013), Felbermayr and Prat (2011).
- Optimal policy with endogenous entry and product variety.
  - Bergin and Corsetti (2008), Bilbiie, Fujiwara, and Ghironi (2011), Chugh and Ghironi (2011), Cacciatore and Ghironi (2012), Faia (2010).
- Monetary transmission and optimal monetary policy in New Keynesian macroeconomic models.
  - Corsetti, Dedola, and Leduc (2011), Galí (2008), Walsh (2010), Woodford (2003).
  - Labor market frictions: Arseneau and Chugh (2008), Blanchard and Galí (2010), Faia (2009), Thomas (2008).

The Model

- Monetary union of two countries: Home and Foreign.
- Cashless economy as in Woodford (2003).
- Each country populated by a unit mass of atomistic households.
- Each household is an extended family with a continuum of members along the unit interval.
- In equilibrium, some family members are unemployed, while some others are employed.
- Perfect insurance within the household $\Rightarrow$ no *ex post* heterogeneity across individual members (Andolfatto, 1996; Merz, 1995).

Household Preferences

- Representative home household maximizes

$$E_0 \sum_{t=0}^{\infty} \beta^t [u(C_t) - l_t v(h_t)], \quad \beta \in (0,1).$$

  - C_t = consumption basket, l_t = number of employed workers, h_t = hours worked by each employed worker.

- C_t aggregates bundles $C_{d,t}$ and $C^*_{x,t}$ of Home and Foreign consumption varieties in Armington form:

$$C_t = \left[(1-\alpha)^{\frac{1}{\phi}} C_{d,t}^{\frac{\phi-1}{\phi}} + \alpha^{\frac{1}{\phi}} C_{x,t}^{*\frac{\phi-1}{\phi}} \right]^{\frac{\phi}{\phi-1}}, \quad 0 < \alpha < 1, \phi > 0.$$

  - $1-\alpha > 1/2$ (and similarly abroad) $\Rightarrow$ home bias in preferences and PPP deviations.

Household Preferences, Continued

- The number of consumption goods available in each country is endogenous.
  - Only subsets of goods $\Omega_{d,t} \subset \Omega_d$ and $\Omega^*_{x,t} \subset \Omega^*_x$ are actually available for consumption.
- Aggregators $C_{d,t}$ and $C^*_{x,t}$ take a translog form following Feenstra (2003a,b).
- $\Rightarrow$ elasticity of substitution across varieties within each sub-basket is an increasing function of the number of goods available.
- This allows us to capture the pro-competitive effect of goods market deregulation on (flexible-price) markups.

Production

- Two vertically integrated production sectors in each country.
- Upstream sector: Perfectly competitive firms use labor to produce a non-tradable intermediate input.
- Downstream sector: Monopolistically competitive firms purchase intermediates and produce differentiated varieties sold to consumers in both countries.
- This production structure greatly simplifies the introduction of labor market frictions.

Labor Market

- Each intermediate producer employs a continuum of workers.
- To hire new workers, firms need to post vacancies, incurring a per-vacancy cost of κ.
- Matching technology generates aggregate matches:

$$M_t = \chi U_t^{1-\varepsilon} V_t^{\varepsilon}, \quad \chi > 0, 0 < \varepsilon < 1.$$

  where U_t = aggregate unemployment and V_t = aggregate vacancies.
- Each firm meets unemployed workers at rate $q_t \equiv M_t / V_t$.

Intermediate Goods Production

- Law of motion of employment, l_t (those who are working at time t), in a given firm:

$$l_t = (1-\lambda)l_{t-1} + q_{t-1}v_{t-1}.$$

- The representative intermediate firm produces:

$$y_t^I = Z_t l_t h_t,$$

$$\begin{bmatrix} \log Z_t \\ \log Z_t^* \end{bmatrix} = \begin{bmatrix} \phi_{11} & \phi_{12} \\ \phi_{21} & \phi_{22} \end{bmatrix} \begin{bmatrix} \log Z_{t-1} \\ \log Z_{t-1}^* \end{bmatrix} + \begin{bmatrix} \epsilon_t \\ \epsilon_t^* \end{bmatrix}.$$

- Quadratic cost of adjusting the hourly nominal wage rate, w_t (Arseneau and Chugh, 2008):

$$\vartheta \pi_{w,t}^2/2, \quad \vartheta \geq 0,$$

where $\pi_{w,t} \equiv (w_t/w_{t-1}) - 1$.

Intermediate Goods Production

- Job creation equation (f.o.c. for l_t and v_t):

$$\frac{\kappa}{q_t} = E_t \left\{ \beta_{t,t+1} \left[(1-\lambda) \frac{\kappa}{q_{t+1}} + \varphi_{t+1} Z_{t+1} h_{t+1} - \frac{w_{t+1}}{P_{t+1}} h_{t+1} - \frac{\vartheta}{2} \pi^2_{w,t+1} \right] \right\}.$$

- w_t solves individual Nash bargaining process.
  - bargaining occurs over nominal wage rather than real wage (Arseneau and Chugh, 2008; Gertler, Trigari, and Sala, 2008).

- Nash bargaining maximizes $J_t^{\eta} H_t^{1-\eta}$ with respect to w_t, where:
  - $\eta \in (0,1)$ is the firm's bargaining power.
  - J_t = real value of existing match for a producer (firm surplus);
  - H_t =value of employment minus outside option (worker surplus):

$$H_t \equiv \frac{w_t}{P_t} h_t - \left(\frac{v(h_t)}{u_{C,t}} + b \right) + (1 - \lambda - \iota_t) E_t \left(\beta_{t,t+1} H_{t+1} \right).$$

Intermediate Goods Production

- Sharing rule:

$$\eta_t H_t + (1 - \eta_t) J_t = 0.$$

- Bargaining shares are time-varying due to the presence of wage adjustment costs (as in Gertler and Trigari, 2009).
  - absent wage adjustment costs, $\eta_t = \eta$ since in this case $\partial J_t / \partial w_t = -\partial H_t / \partial w_t$.

- Bargained wage:

$$\frac{w_t}{P_t} h_t = \eta_t \left(\frac{v(h_t)}{u_{C,t}} + b \right) + (1 - \eta_t) \left(\varphi_t Z_t h_t + E_t \beta_{t,t+1} \Omega_{t,t+1} J_{t+1} \right).$$

- Hours, h_t, determined by firms and workers in a privately efficient way: $v_{h,t} / u_{C,t} = \varphi_t Z_t$.

Final Goods Production

- Continuum of monopolistically competitive final-sector firms.
  - Produce using domestic intermediate inputs; sell domestically and abroad.
- Absent trade costs, L.O.P. holds: $p_{x,t}(\omega) = p_{d,t}(\omega)$.
  - Translog preferences do not imply pricing-to-market.
  - Producers face the same elasticity of substitutions across domestic and export markets when all goods are traded.
- Optimal prices:

$$\rho_{d,t}(\omega) \equiv p_{d,t(\omega)} / P_t = \mu_t(\omega)\varphi_t, \quad \text{with} \quad \mu_t(\omega) \equiv \frac{\theta_t(\omega)}{(\theta_t(\omega) - 1)\,\Xi_t},$$

  - Two sources of endogenous markup variation: translog preferences and price stickiness.

Final Goods Production, Continued

- Final sector firms face a sunk entry cost $f_{E,t}$ in units of intermediate input.
  - $f_{E,t}$ reflects both a technological constraint ($f_{T,t}$) and administrative costs related to regulation ($f_{R,t}$), i.e., $f_{E,t} \equiv f_{T,t} + f_{R,t}$.
- Time-to-build lag: Entrants at time t start producing only at $t+1$:

$$N_t = (1-\delta)(N_{t-1} + N_{E,t-1}).$$

- Prospective entrants compute expected post-entry value

$$e_t = E_t \sum_{s=t}^{\infty} \left[\beta\left(1-\delta\right)\right]^{s-t} \left(u_{C,s}/u_{C,t}\right) d_s.$$

- Free entry condition:

$$e_t = \varphi_t f_{E,t}.$$

Household Intertemporal Decisions

- Representative household can invest in two types of assets:
  - shares in mutual funds of domestic firms.
  - non-contingent bonds, traded domestically and internationally.
- Costs of adjusting bond holdings (steady-state determinacy and stationarity of the model).
  - Standard Euler equations for bond holdings.
- Home net foreign assets:

$$a_{t+1} = \frac{1+i_t}{1+\pi_{C,t}} a_t + N_t \rho_{d,t} y_{x,t} - N_t^* Q_t \rho_{d,t}^* y_{x,t}^*.$$

Monetary Policy

- Compare the Ramsey-optimal monetary policy to historical behavior for ECB.

- Historical ECB policy captured by a standard rule for interest rate setting in the spirit of Taylor (1993), Woodford (2003), and much other literature:

$$1 + i_{t+1} = (1 + i_t)^{\varrho_i} \left[(1 + i) \left(1 + \tilde{\pi}^U_{C,t} \right)^{\varrho_\pi} \left(\tilde{Y}^U_{g,t} \right)^{\varrho_Y} \right]^{1-\varrho_i}.$$

  - $\tilde{\pi}^U_{C,t} \equiv \tilde{\pi}^{\frac{1}{2}}_{C,t} \tilde{\pi}^{*\frac{1}{2}}_{C,t}$ = data-consistent, union-wide CPI inflation;
  - $\tilde{Y}^U_{g,t} \equiv \tilde{Y}^{\frac{1}{2}}_{g,t} \tilde{Y}^{*\frac{1}{2}}_{g,t}$ = data-consistent, union-wide GDP gap.

TABLE 4: CALIBRATION

	Parameter	Value	Source/Target
Risk Aversion	$\gamma_C =$	2	*Lit.*
Frisch Elasticity	$1/\gamma_h =$	0.2	*Lit.*
Discount Factor	$\beta =$	0.99	$r = 4\%$
Elasticity Matching Function	$\varepsilon =$	0.6	*Lit.*
Firm Bargaining Power	$\eta =$	0.6	*Hosios*
Replacement Rate	$\psi_R =$	0.64	*Data*
Exogenous separation	$\lambda =$	0.06	*Lit.*
Vacancy Cost	$k =$	0.28	$U = 12\%$
Matching Efficiency	$\chi =$	0.58	$q = 0.7$
Elasticity across Home and Foreign goods	$\phi =$	3.8	*Lit.*
Home Bias	$\alpha =$	0.2	*Lit.*
Translog Shifter	$\sigma =$	0.62	*Markup*
Plant Exit	$\delta =$	0.026	$\frac{JD^{EXIT}}{JD} = 0.4$
Regulation Cost	$f_R =$	$0.69GDP^{SS}$	*Data*
R&D Entry Cost	$f_D =$	$0.18GDP^{SS}$	*Lit.*
Rotemberg Adj Price	$\nu =$	80	*Lit.*
Rotemberg Adj Price	$\vartheta =$	60	$\frac{\sigma_U}{\sigma_{GDP}}$
Taylor - Interest Rate Smoothing	$\varrho_i =$	0.87	*Lit.*
Taylor - Inflation Parameter	$\varrho_\pi =$	1.93	*Lit.*
Taylor - Output Gap Parameter	$\varrho_{GAP} =$	0.075	*Lit.*
Bond Adjustment Cost	$\tau =$	0.0025	*Lit.*
Std Productivity Shock	$\sigma_A =$	0.0068	σ_{GDP}
Persistence Productivity Shock	$\varrho_A =$	0.999	*Lit.*
Correlation between Home and Foreign Shocks		0.253	*Lit.*

TABLE A.1: BUSINESS CYCLE STATISTICS

Variable	$\sigma_{X_R^U}$			$\sigma_{X_R^U}/\sigma_{Y_R^U}$			1st Autocorr			$corr(X_{R,t}^U, Y_{R,t}^U)$		
Y_R^U	**1.32**	1.32	*1.30*	**1**	1	*1*	**0.91**	0.76	*0.74*	**1**	1	*1*
C_R^U	**0.68**	1.00	*0.76*	**0.51**	0.75	*0.58*	**0.89**	0.72	*0.72*	**0.87**	0.99	*0.88*
I_R^U	**3.30**	3.09	*4.13*	**2.50**	2.34	*3.18*	**0.89**	0.76	*0.76*	**0.94**	0.64	*0.71*
l^U	**0.50**	0.50	*0.46*	**0.38**	0.38	*0.35*	**0.92**	0.81	*0.81*	**0.88**	0.76	*0.73*
w_R^{Ur}	**0.50**	0.54	*0.49*	**0.38**	0.41	*0.38*	**0.85**	0.94	*0.91*	**0.16**	0.62	*0.71*
$corr(C_{R,t}, C_{R,t}^*)$	**0.55**	0.29	*0.97*									
$corr(Y_{R,t}, Y_{R,t}^*)$	**0.86**	0.36	*0.41*									

Bold fonts denote data moments, normal fonts denote moments for the Baxter calibration of productivity, and italics denote the BKK calibration.

TABLE 3: DISTORTIONS

$\Upsilon_{\mu,t} \equiv \frac{\mu_{t-1}}{\mu_t} - 1$	time-varying markup*, product creation
$\Upsilon_{N,t} \equiv \mu_{t-1}\left(1 - \frac{1}{\mu_t} - \frac{\nu}{2}\pi_{d,t}^2\right) - \frac{1}{2\sigma N_t}$	misalignment between markup and benefit from variety*, product creation
$\Upsilon_{R,t} \equiv f_{R,t}$	regulation costs, product creation, resource constraint
$\Upsilon_{\varphi,t} \equiv \frac{1}{\mu_t} - 1$	monopoly power and time-varying markup*, job creation and labor supply
$\Upsilon_{\eta,t} \equiv \eta_t - \varepsilon$	failure of the Hosios condition**, job creation
$\Upsilon_{b,t} \equiv b$	unemployment benefits, job creation
$\Upsilon_{Q,t} \equiv \frac{u_{C^*,t}}{u_{C,t}}/Q_t$	incomplete markets, risk sharing
$\Upsilon_{a,t} \equiv \tau a_{t+1}$	cost of adjusting bond holdings, risk sharing
$\Upsilon_{\pi_w,t} \equiv \frac{\vartheta}{2}\pi_{w,t}^2$	wage adjustment costs, resource constraint and job creation
$\Upsilon_{\pi_d,t} \equiv \frac{\nu}{2}\pi_{d,t}^2$	price adjustment costs, resource constraint

* From translog preferences and sticky prices.

** From sticky wages and/or $\eta \neq \varepsilon$.

Inefficiency Wedges and Policy Tradeoffs

- Market allocation is efficient only if all the distortions and associated inefficiency wedges are closed at all points in time.

- The Ramsey central bank optimally uses its leverage on the economy via the sticky-price and sticky-wage distortions.
  - Optimal policy trades off their costs against the possibility of addressing the distortions that characterize the market economy under flexible wages and prices.

- Although the model features various distortions, several of them have the same qualitative implications for optimal policy.

- Therefore, the Ramsey central bank actually faces a small number of policy *tradeoffs*—with intuitive policy implications—both in the long run and over the business cycle.

TABLE 5: WELFARE EFFECTS OF REFORMS – NON STOCHASTIC STEADY STATE

Market Reform	Δ Welfare – Historical		Δ Welfare – Ramsey		Ramsey Inflation
	Home	Foreign	Home	Foreign	
Status Quo	0%	0%	0.21%	0.21%	1.20%
Asy PMR	5.00%	0.22%	5.09%	0.41%	1.07%
Asy LMR	3.32%	0.21%	3.44%	0.39%	1.00%
Asy GLOBAL	7.38%	0.38%	7.41%	0.55%	0.96%
Sym PMR	5.22%	5.22%	5.30%	5.30%	1.00%
Sym LMR	3.51%	3.51%	3.61%	3.61%	0.85%
Sym GLOBAL	7.72%	7.72%	7.76%	7.76%	0.76%

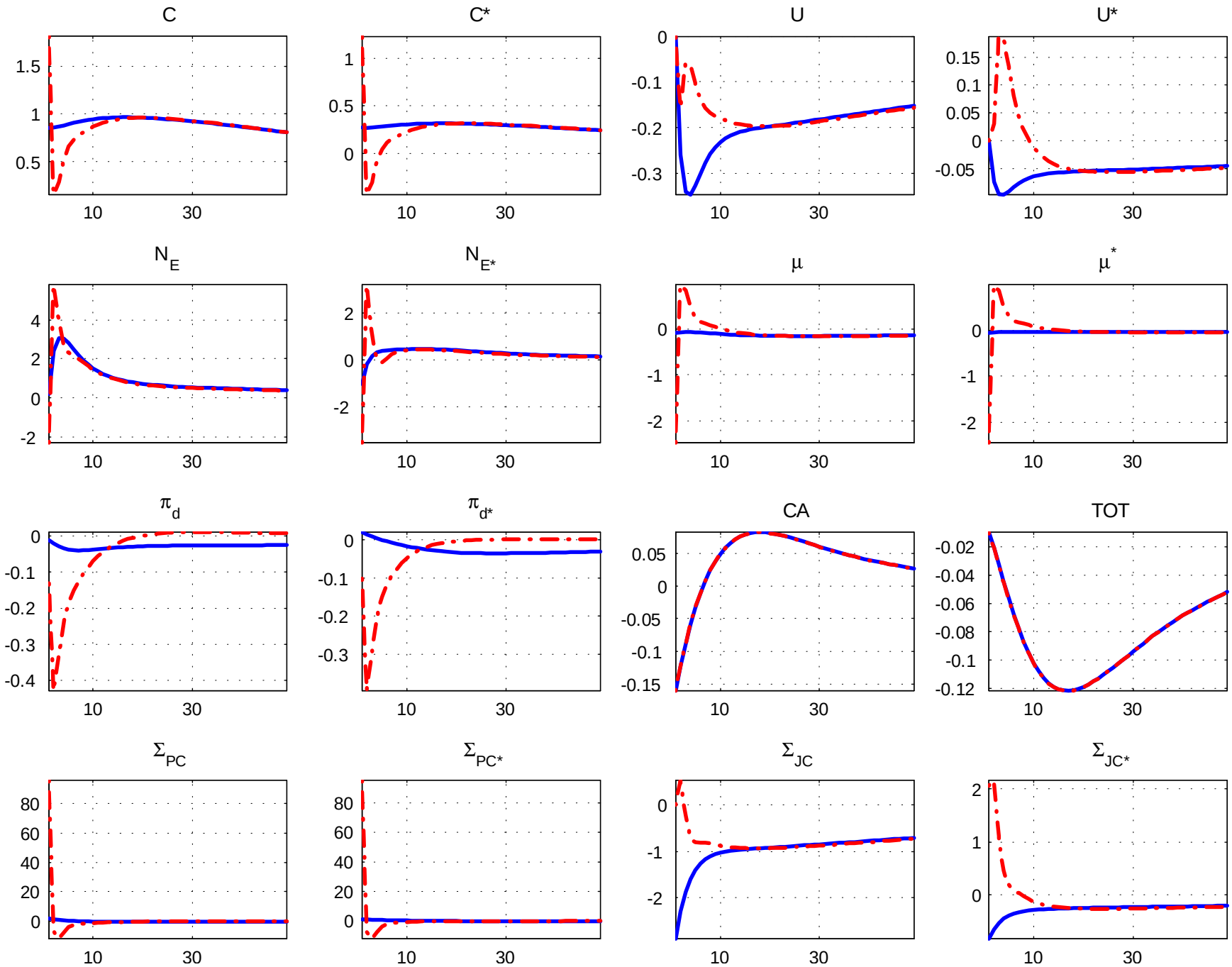

Figure 1: Home Productivity Shock, High Regulation, Historical Policy (Solid) versus Optimal Policy (Dashed).

TABLE 6: WELFARE EFFECTS OF REFORMS — STOCHASTIC STEADY STATE

Market Reform	Welfare Cost – Historical		Welfare Cost – Ramsey	
	Home	Foreign	Home	Foreign
Status Quo	0.94%	0.94%	0.75%	0.75%
Asy PMR	0.78%	0.93%	0.65%	0.72%
Asy LMR	0.55%	0.92%	0.50%	0.70%
Asy GLOBAL	0.54%	0.92%	0.49%	0.69%
Sym PMR	0.77%	0.77%	0.62%	0.62%
Sym LMR	0.54%	0.54%	0.46%	0.46%
Sym GLOBAL	0.53%	0.53%	0.45%	0.45%

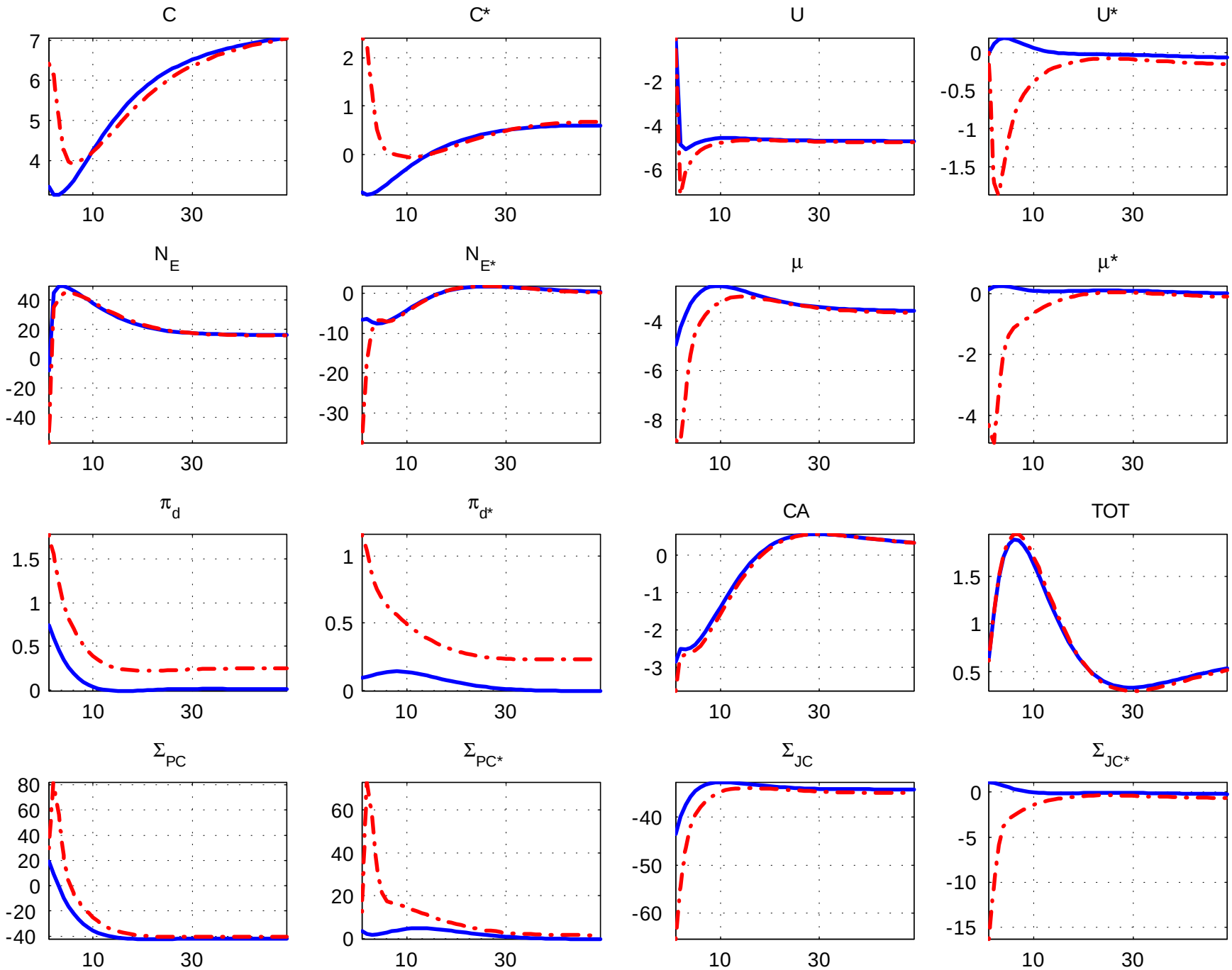

Figure 4: Home Product and Labor Market Deregulation, Historical Policy (Solid) versus Optimal Policy (Dashed).

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Asy LMR	0.55%	0.92%	0.50%	0.70%
Asy GLOBAL	0.54%	0.92%	0.49%	0.69%
Sym PMR	0.77%	0.77%	0.62%	0.62%
Sym LMR	0.54%	0.54%	0.46%	0.46%
Sym GLOBAL	0.53%	0.53%	0.45%	0.45%

Conclusions

- We studied the implications of market deregulation for the conduct of optimal monetary policy in a monetary union.
- High levels of regulation generate sizable static and dynamic distortions that call for active monetary policy in the long run and over the business cycle.
  - Strict price stability is costly in terms of welfare.
- Expansionary monetary policy can reduce transition costs by generating lower markups and stimulating job creation in the aftermath of market reforms.
- Once the economies have reached the new long-run equilibrium, real distortions in product and labor markets are reduced, and the need for inflation to correct market inefficiencies correspondingly mitigated.
- International coordination of reforms is desirable to mitigate new policy tradeoffs generated by asymmetric product and labor market reforms.

Conclusions, Continued

- We provide formal support for arguments in the policy literature that market reforms should be accompanied by appropriate aggregate demand policies (Barkbu et al., 2012).
- And we provide additional support for the argument that monetary policy in "sclerotic" markets should not be narrowly focused on inflation (Blanchard and Galí, 2010).
- Important avenues for future research include crisis responses, distributional issues, fiscal policy, strategic interactions, and the possibility of imperfect commitment.